Primary percutaneous coronary intervention of an anomalous right coronary artery arising from the left coronary cusp using an undersized Judkins catheter: A case report

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Occlusion of an anomalous right coronary artery arising from the left coronary cusp is a rare cause of acute inferior wall myocardial infarction. The case of a 66-year-old man who presented with an acute inferior wall myocardial infarction from occlusion of an anomalous

right coronary artery arising from the left coronary cusp is described. An undersized Judkins left guide catheter was successfully used to perform primary percutaneous coronary intervention for this anomaly. Computed tomographic angiography was subsequently used to characterize the origin and anatomical course of the anomalous right coronary artery and assess coronary stent patency.

Key Words: *Anomalous coronary artery; Computed tomographic angiography; Judkins catheter; Primary PCI*

Anomalous coronary arteries are found in approximately 1% of patients undergoing elective coronary angiography (1). Percutaneous coronary intervention (PCI) of anomalous coronary arteries can be challenging because the unusual location of the vessel often results in suboptimal guide catheter support. We report a case of an acute inferior wall myocardial infarction caused by occlusion of an anomalous right coronary artery that arose from the left coronary cusp. Primary PCI was performed using an undersized Judkins guide catheter that was coiled within the left coronary sinus. Computed tomography (CT) angiography later delineated the course of the anomalous right coronary artery arising from the left coronary cusp and showed widely patent coronary stents.

CASE PRESENTATION

A 66-year-old man with a history of hypertension presented to the emergency department with complaints of chest pain of 6 h duration. Physical examination was notable for elevated jugular venous pulsations (approximately 10 cm H₂O), no cardiac murmurs or S₃, clear lungs and no peripheral edema. The initial electrocardiogram showed 4 mm of ST segment elevation in the inferior leads and 2 mm of ST segment depression in the anterior leads consistent with an acute inferior wall ST elevation myocardial infarction. A right-sided electrocardiogram showed 2 mm of ST segment elevation in lead VR₄. Acetylsalicylic acid, beta-blockers and intravenous nitrates and heparin were given, and he was taken to the cardiac catheterization laboratory.

Left ventriculography showed hypokinesis of the inferior wall segment and overall preserved left ventricular function. Left coronary angiography using a 4.0 Judkins left catheter showed mild irregularities of the left anterior descending artery and no left-to-right collaterals. The right coronary artery could not be engaged with a Judkins right or an Amplatz left diagnostic catheter. The ostium of the right coronary artery was nonselectively cannulated by coiling a 3.5 Judkins guide catheter within the left coronary cusp (Figure 1A). Although selective cannulation of the right coronary ostium was not obtained, excellent support was achieved because of direct contact of the guide catheter with the left coronary cusp. An over-the-wire system was used and the area of occlusion crossed using a 2.0 mm × 20 mm Maverick balloon and a choice floppy guidewire. The mid right coronary artery was predilated with the 2.0 mm balloon with improvement in distal flow. Two overlapping stents (3.0 mm × 20 mm ZETA and 3.0 mm × 16 mm ZETA, Abbott, USA) were placed with a good angiographic result. Final angiography showed Thrombolysis in Myocardial Infarction (TIMI) grade 3 flow and no residual thrombus (Figure 1B). The remainder of the hospital course was unremarkable and the patient was discharged home on hospital day 4.

Two months following hospital discharge, CT angiography was performed to further evaluate the course of the right coronary artery and assess coronary stent patency (Figures 2A and 2B). CT angiography clearly demonstrated the origin of the right coronary artery arising from the left coronary cusp,

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Figure 1) Coronary angiography of an anomalous right coronary artery origin from the left coronary cusp (white arrow), adjacent to the left main coronary artery (white arrow head). **A** The right coronary artery is occluded in the proximal portion (black arrow). The Judkins guide catheter is coiled in the left coronary cusp and oriented toward the origin of the anomalous right coronary artery. **B** Final angiography following angioplasty and stent placement showing a widely patent right coronary artery

Figure 2) Computed tomography angiography showing an anomalous origin of the right coronary artery from the left coronary cusp (white arrow head), adjacent to the left main coronary artery (white arrow) (**A**). **B** The right coronary artery travels anterior to the aorta (Ao) and posterior to the pulmonary artery (P). Coronary stents are present and widely patent in the proximal and mid portions of the right coronary artery (black arrow). The left coronary artery arises from the normal position in the left coronary cusp (white arrow)

slightly inferior to the origin of the left main coronary artery. The coronary stents were visible within the proximal and mid portions of the right coronary artery, and were widely patent.

DISCUSSION

The classic paper describing coronary anomalies was published by Yamanaka and Hobbs from the Cleveland Clinic Foundation in 1990 (1). In this series of 126,595 patients undergoing coronary angiography over a 28-year period, the authors found the prevalence of coronary artery anomalies to be 1.3%. Benign anomalies were present in 81% of patients,

with the two most common variants being a separate origin of the left anterior descending and circumflex arteries from the left coronary cusp (also referred to as a dual ostium left anterior descending and circumflex arteries), and the circumflex artery arising from the right sinus of Valsalva or the right coronary artery. An anomalous right coronary artery arising from the left coronary cusp was present in 0.11% of all cases and comprised 8% of the total anomalies present.

The unusual location of the ostium of an anomalous right coronary artery often makes selective cannulation difficult (2). In addition, performing PCI on an anomalous right coronary

artery can be challenging because of suboptimal guide catheter support, and several strategies have been described (3). The use of Amplatz left (3,4), Voda (5) and oversized Judkins left guide catheters (6,7) for this anomaly has been well described. To our knowledge, there have been no prior case reports describing the use of an undersized Judkins left guide catheter for this specific anomaly. We found this approach to be particularly useful because the undersized Judkins catheter could be coiled within the left coronary sinus with the tip directed in a coaxial manner to the ostium of the anomalous right coronary artery. Coiling the guide catheter tip placed the proximal portion of the guide catheter in direct contact with the left coronary sinus and yielded excellent support. A 6 Fr system guide catheter was used for this purpose because of the increased ability of the smaller Fr guide catheters to be manipulated and rotated without kinking of the catheter shaft.

In recent years, CT angiography has played an increasing role in the noninvasive evaluation of anomalous coronary arteries (8). CT angiography provides a three-dimensional view of the entire coronary tree, thus allowing accurate assessment of the origin and subsequent course of anomalous vessels. The diagnostic accuracy of CT angiography in patients with coronary anomalies is exceptional (Table 1) (8-12). The ability to administer contrast medium via a peripheral vein, the rapid scanning time and the excellent diagnostic accuracy allow CT angiography to be a useful imaging modality in patients with suspected coronary anomalies.

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TABLE 1
Summary of studies evaluating the diagnostic accuracy of computed tomography (CT) angiography for coronary anomalies

Reference	Patients, n	Type of CT scanner used	Diagnostic accuracy of CT angiography
Ropers et al, 2001 (12)	30	EBT	29/30 (97%)
van Ooijen et al, 2004 (11)	13	16 MSCT	13/13 (100%)
Datta et al, 2005 (8)	17	16 MSCT	17/17 (100%)
Memisoglu et al, 2005 (10)	14	EBT	14/14 (100%)
Schmid et al, 2006 (9)	35	16 MSCT	35/35 (100%)

EBT Electron beam computed tomography; MSCT Multislice computed tomography

In summary, this is the first case report describing the use of an undersized Judkins left catheter to perform primary PCI on an anomalous right coronary artery arising from the left coronary cusp. We found CT angiography to be useful in characterizing the origin and course of the anomalous artery and evaluating coronary stent patency.

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